**Md Towhedur Rahman-u2151946-Computer Science**

**Week 2 - Number Systems**

**Tutorial Questions**

1. What is the *base* of a number system?

Ans. The number of different digits including zero that exist in the number system.

1. What is the base of the

Binary number system?

Ans: 2

Decimal number system?

Ans: 10

Hexadecimal number system?

Ans:16

1. Each digit in a binary number (known as a bit) can have one of two values. What are these two values?

Ans: The two values are: 0 and 1.

1. How many different values can a digit in a decimal number take?

Ans: 10

What are these values?

Ans: 0,1,2,3,4,5,6,7,8,9

1. Find the value of *n* where

7658 = 7 x *n*2 + 6 x *n*1 + 5 x *n*0

**Ans: The value of n is 8.**

1. Find the values of *a*, *b*, *c*, *d* and *e* where

540316 = 5 x 6*a* + 4 x 6*b* + 0 x 6*c* + 3 x 6*d*+ 1 x 6*e*

***Ans: The values of***

**a=4,**

**b=3,**

**c=2,**

**d=1,**

**e=0**

1. Perform the following calculations. You can check your answers using a calculator.
   1. 11011012 + 101012
      1. **1 0 1 1 0 1**

**+ 1 0 1 0 1**

**……………………….**

1. **0 0 0 0 0 1 0**
   1. 2068 + 478

**206**

**+47 13**

**………………… -(b)8**

**25(c 1) 5 …………………………….**

**=255(Ans) 5 remaining**

* 1. 1012 x 1012

**Ans: 11001 (do the normal multiplication and when you are adding follow the same rule as above.)**

(Hint: we did not cover multiplication in the lecture, but you should be able to work out the answer if you use the same approach as you would when multiplying decimal numbers. Remember that positional number systems all behave in the same way! It is the base that distinguishes them.)

1. Convert 23768 to base 10

Calculation:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Place | 83 | 82 | 81 | 80 |
| Value | 512 | 64 | 8 | 1 |
| Evaluation | 2\*512 | 3\*64 | 7\*8 | 6\*1 |
| total | 1024 | 192 | 56 | 6 |

**Answer is- 1024+192+56+6=127810**

**Note to remember- power 0= always 1**

1. Convert 10101112 to base 10.

Calculation:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Ans: 8710

1. Convert 78910 to base 6 (using base and carry)

Calculation:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Ans:33536

1. Convert 21710 to base 2 (using base and carry)

Calculation:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

Answer is

1. How are the equivalents of the decimal numbers 10, 11, 12, 13, 14 and 15 represented in hexadecimal?

**Calculation:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Ans:

1. Convert the following binary number to hexadecimal: **1011110101101.**

**Calculation:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Ans:

1. Convert the following hexadecimal number to binary: **7FE5**

*You will find this table useful whenever you need to convert binary numbers to hexadecimal or vice-versa.*

|  |  |  |  |
| --- | --- | --- | --- |
| Hexadecimal | Binary | Hexadecimal | Binary |
| **0** | **0000** | **8** | **1000** |
| **1** | **0001** | **9** | **1001** |
| **2** | **0010** | **A** | **1010** |
| **3** | **0011** | **B** | **1011** |
| **4** | **0100** | **C** | **1100** |
| **5** | **0101** | **D** | **1101** |
| **6** | **0110** | **E** | **1110** |
| **7** | **0111** | **F** | **1111** |

1. **Stretch Question:**

The following binary number **1.1110** contains both a whole number and a fractional part. The fractional part is to the right of the binary point (sometimes refer to the radix point). We know that moving a bit one place to the left doubles the value of the bit (in terms of place values, 20 becomes 21, 21 becomes 22 and so on) and moving a bit one place to the right halves the value of the bit (22 becomes 21, 21 becomes 20 etc.) What then do the bits in **1.1110** represent and what is this binary number’s equivalent value in decimal?